Construction of a scientific abstract

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An abstract is a brief summary of a research article, thesis, review, conference proceeding, or any in-depth analysis of a particular subject [1]. It is used to help the reader quickly ascertain the authors' principle messages.

The aim of this text is to strengthen the understanding of abstract writing, define its specific components, and to help the writer evaluate and complete their abstract with enhanced clarity and quality [2].

Typically, the academic research abstract contains four elements: objective and study design, materials and methods, results, and discussion/conclusions. During peer review, it is important that authors adhere to this format, as reviewers often evaluate these parts separately.

Objective and study design

The problem description should be clear and well defined. It can be a formal hypothesis or a description of the aim of a study. If well defined, an experienced reviewer can understand why a specific study design has been chosen, and if it is the best way to address the hypothesis. When the study design is not provided, the abstract will be harder to evaluate.

Materials and methods

The purpose of this section is to demonstrate to the reviewer that the methods used are appropriate and complete for answering the research question. This begins with an accurate description of the study population and identification of any control group(s). If utilized, matching or randomizing should be described. Any intervention should be depicted with enough specification to minimize any suggestion of bias. It is critical to state length of follow-up. Statistical methods used should be stated for all comparisons. For reviews, include MESH-terms, time span of the publication years, and names of databases. Validation methods should be included, if appropriate.

Results

This should be an objective and concise presentation of the principal findings that lead to the main conclusions, without any interpretation of the results. The sum of

subgroup numbers must always equal the total subject number. Unless variables are normally distributed, median and interquartile ranges should be reported rather than mean and standard deviation. Unless large populations are described, percentages alone should not be used.

Discussion/Conclusion

This section should consist of a realistic interpretation of the findings, and the description of their relation to the hypothesis. Only findings supported by the results should be discussed. Conclusions should preferably be one, but no more than two sentences long.

General

Study limitations can be omitted in the abstract. References to manuscripts and other literature sources should likewise be avoided, unless the study addresses the key finding of a specific prior study. The best abstracts can only be written as a result of a good study design. However, if an abstract does not comply with a publication's guidelines, with respect to subheadings and word count, even an excellent study with a good abstract might be rejected. For good and bad examples of the different parts of an abstract, please refer to the supplementary material.

References

1. Blake G, Bly RW. The elements of technical writing. New York: Macmillan Publishers; 2015.

2. Poolman RW, Keijser LC, de Waal Malefijt MC, Blankevoort L, Farrokhyar F, Bhandari M. Reviewer agreement in scoring 419 abstracts for scientific orthopedics meetings. *Acta Orthop* 2007: **78**:278-84.

On behalf of the ESPU Research Committee
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Supplementary material

The given examples are put in the text to ease understanding, and do not refer to any existing research articles as far as we know.

Sample 1: Objectives and Study design

Bad and good examples of a problem description and methods description in an abstract.

Bad: ‘Suits never fit all people. Therefore we calculated the mean difference in height between Swedish and Spanish young men and we did a systematic review in the literature’

Good: ‘The goal of the present company is to produce trousers in sizes that fit all people all over the world. Research has shown that the best fit would be obtained by taking into account the mean difference in height between populations. A systematic review was conducted to determine how to estimate the height of randomly chosen people. This manuscript describes the results of the systematic review and the measurements.’

Sample 2: Materials and Methods

Bad and good examples of a material/methods section of an abstract.

Bad: ‘We measured 100 visitors of our stores, mean age was 35. We measured the length of the arms with a measuring tape. Values are in centimeters’

Good: ‘One hundred randomly selected visitors to our stores were measured. The current systematic review (MESH terms: population, height; databases: Pubmed, Embase) revealed that the most precise surrogate for height across populations is measuring the arm span. Therefore, the span between the fingertips of the middle finger of both arms, stretched out horizontally in the sagittal plane, was measured in centimeters using a measuring tape approved for clinical use.’

Sample 3: Results

Bad and good examples of a discussion/conclusion of an abstract.

Bad: ‘We determined that mean arm span was 181.06 cm (range: 172-190 cm) and this was highly correlated with height 182.58 cm (range: 172-192), $p<0.05$. This was in line with our expectations.’

Good: ‘It was determined that median arm span was 173 cm (range: 172-190 cm) and this was highly correlated with height 172 cm (range: 172-192), *P*=0.03.’

Sample 4: Discussion/Conclusion

Bad and good examples of a discussion/conclusion of an abstract.

Bad: ‘We conclude that arm span is best for measurement of height. We now sell the best trousers for all people’

Good: ‘Arm span was reported to be the best way to estimate height of randomly chosen people. As the mean difference in height was found to be 10 cm, it was decided to leave all trousers long and offer to shorten them for free.’